

[3.0042]

A NEW PHOLISORA WITH NOTES ON *P. alpheus* (Edw.)
(LEPIDOPTERA: HESPERIIDAE)¹

C. DON MacNEILL²

This paper provides a name for a species of *Pholisora* for use in several other works currently in preparation. This new species is the third member of the closely related group designated by Dyar (1905: 118) as the genus *Hesperopsis*. These three species are fundamentally similar with respect to wing markings, secondary sexual characteristics, genitalic structure of males, and egg morphology, in striking contrast to the two remaining species of *Pholisora* (which also are vastly divergent from one another). This unit, recognized by Dyar, comprises at least a subgenus *Hesperopsis* Dyar and includes *Pholisora* (*Hesperopsis*) *alpheus* (Edw.), *P. (H.) libya* (Scud.) and *P. (H.) graciellae*, new species. *P. (H.) graciellae* is very closely related to *P. alpheus* with which it has been confused in the literature. This paper will consider only these two species of this subgenus but polytypic *P. libya* is also in need of distributional scrutiny in the future.

***Pholisora graciellae*, NEW SPECIES**
(Figures 1, 2, 5, 6)

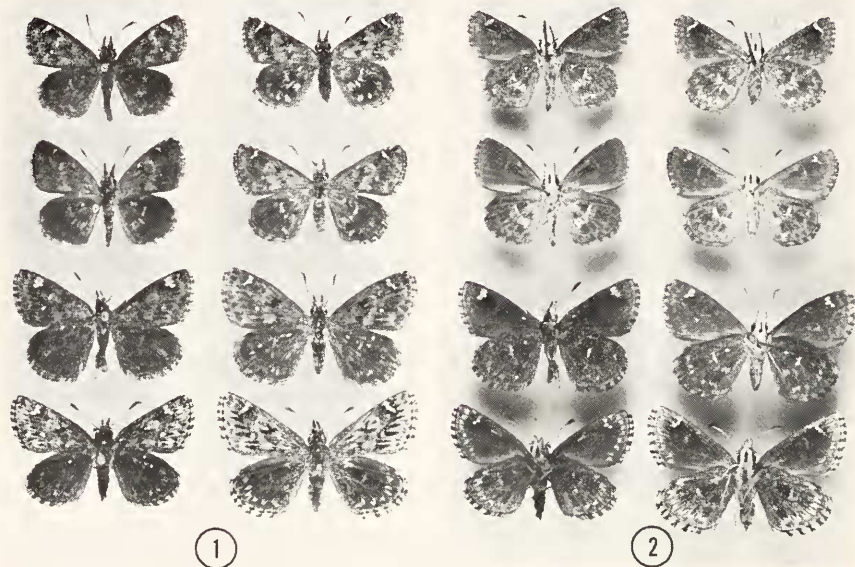
Diagnosis: This is a small species with very long palpi. The forewings above usually have a post-discal sigmoid series of poorly defined, short blackish spots, which are scarcely elongate wedge-shaped, running from the soiled white subapical spots to the vannal margin. The hindwings above usually have a pale brown or buff curved band of spots extending from the cell end to the vannal fold, and a less conspicuous submarginal series of poorly defined separated buff spots. The lower surface of the hindwing has a conspicuous curved series of white spots separated by dark veins extending from the end of the cell to the vannal fold, which is contrastingly gray overscaled. The submarginal white spots are usu-

¹ Accepted for publication May 4, 1970.

² Division of Natural Sciences, Oakland Museum, Oakland, California 94607.

ally well developed only on the vannal one-half of the wing, and are never more prominent than the discal series of curved white spots. The length of the forewing of males ranges from 9 mm to 11.5 mm; that of the females from 10 mm to 12 mm.

The species is named for my wife, who was a great help to me during all phases of this study.



Figures 1-2. Adults of *Pholisora*. Top tier, *P. graciellae* (spring); second tier, *P. graciellae* (fall); third tier, *P. alpheus alpheus*; bottom tier, *P. alpheus oricus*. Fig. 1, upper side, males left, females right. Fig. 2, lower side, males left, females right.

Holotype MALE: Head with palpi long, projecting forward from below center of eye a distance greater than greatest width of head. Upper surface of forewing brown, liberally dusted with buff overscaling. Subapical spots sullied white and not prominent, their proximal margin defined by a minute curved blackish line continuing as a sigmoid series of ill-defined small dark spots, not wedge-shaped, to the vannal margin, and enclosing in spaces 2, 4, and 5 obscure buff spots. Fringe brownish buff, obscurely checkered with dark brown. Forewing length: 10 mm. Hindwing dark blackish brown with buff overscaling restricted to vannal fold, a submarginal series of vague pale spots on vannal one-half of wing, and an ill-defined curved pale band from cell to vannal fold. Fringe brownish buff, obscurely checkered with dark brown. Lower surface of hindwing dark brown, densely overscaled with buff. Submarginally with a series of poorly defined white spots gradually becoming obso-

lete on the costal one-half of the margin. A curved series of white spots extends from end of cell to vannal fold, and in mid cell is one white dot. Vannal fold buffy gray. Genitalia with caudal process of valva very slender, directed laterally, and slightly ventrad, the terminal portion flattened horizontally by disto-lateral position of subterminal wings. Penis with caudal bevel prolonged, the ventral tip exceeding the dorsal portion by a distance much greater than caudal diameter of penis.

Allotype FEMALE: Much as in male but upper surface of forewing paler with dark markings more distinct, especially the discal series through middle of cell, and a small sub-basal dark spot in cell. End of cell defined by vague pale bar. The sigmoid series of dark spots running from subapical spots to vannal margin conspicuous, a few short wedge-shaped, and several enclosing small pale buff spots. Forewing length: 10 mm. Hindwing dark brown, less blackish than in male, and with pale spots buff-white and better defined. Lower surface of hindwing as in male but with white spots more sharply defined.

Material examined: HOLOTYPE, male: CALIFORNIA, San Bernardino Co., Bennett Wash, vicinity Parker Dam, IV-22-51 (C. D. MacNeill). ALLOTYPE, female: same data as holotype. PARATYPES: 92 specimens as follows: same data as holotype, 10 males, 2 females; CALIFORNIA, San Bernardino Co., nr. Earp, IV-29-49 (C. D. MacNeill) 1 male, 5 females; 10 mi. n.e. Earp, IV-18-64 (Langston and MacNeill) 35 males, 1 female; Needles, IV-17-64 (Langston and MacNeill) 3 males, 3 females; Riverside Co., Blythe, IV-10-21, 1 male; nr. Blythe, IV-27-49 (C. D. MacNeill) 2 males, 1 female; Blythe, VII-8-56 (A. Menke, Jr.) 1 female; ARIZONA, Yuma Co., Colorado R. at Parker, IV-18-64 (Langston and MacNeill) 21 males, 6 females.

The holotype and allotype will be deposited in the collection of the California Academy of Sciences. Paratypes will be placed in the collections of the following institutions and individuals: California Academy of Sciences, Los Angeles County Museum, American Museum of Natural History, California Insect Survey, J. M. Burns, H. A. Freeman, K. C. Hughs, R. O. Kendell, R. L. Langston, C. D. MacNeill, K. Roever, and J. W. Tilden.

In addition to the type material, 37 males and 8 females of the spring brood (dated April and May) from the Imperial Valley of southern California have been examined, and 43 males and 11 females of the late summer brood have been seen. These represent localities from near Parker in Yuma Co., Arizona, south to Yuma, and in the Imperial Valley of California. Dates of collection of these specimens extend from late July to October.

DISCUSSION

Adults of *P. graciellae* representing the late summer and fall brood are noticeably much darker insects, particularly the males. In these the upper surface may be almost entirely unmarked, with even the subapical pale spots absent. The slightly curved band of pale spots extending from the end of the cell to the pale vannal fold on the lower surface of the hindwing may be the only whitish spots on males of this late brood, although this band is usually suggested on the upper surface in lighter brown.

On the upper surface of the forewing *P. graciellae* differs from *P. alpheus* in that the post-discal sigmoid series of black marks are short, generally not conspicuously elongated into slender wedge-shaped dashes. The overscaling is buff in color, not white, and it is especially prominent in females where the non-descript black markings are contrasting. The pale spots of the forewing are usually

buff, not white, and the fringes of both wings are obscurely buff and dark brown or black checkered. The lower surface of the hindwing is usually distinctive in that the curved series of whitish spots running from the cell end to the pale vanal fold is at least as prominent as the submarginal series of pale spots. This latter is generally poorly developed and the spots become obsolete on the costal one-half of the wing. The palpi are generally distinctly longer in *P. graciellae* than in *P. alpheus*. The male genitalia are very similar to those of *P. alpheus*. The long caudal process of the valva extends backward in a curve directed laterally as in *P. alpheus*, but the minute subterminal wing of that process which gives the tip a flattened aspect, is located laterally and the consequent horizontally flattened tip tends to be directed very slightly ventrad (see fig. 6). This



Figures 3-5. Head and palpi of *Pholisora* males, dorsal aspect. Fig. 3, *P. alpheus* *alpheus*; Fig. 4, *P. alpheus* *oricus*; Fig. 5, *P. graciellae* (Holotype).

condition seems to obtain only in certain populations of *P. alpheus* which, however, are superficially quite unlike *P. graciellae*. Because of the laterally divergent arc these processes demonstrate in both species, the additional dorsal or ventral deflection of the tip is difficult to ascertain once the genitalic parts have been separated after dissection. This critical deflection is relative to the position of the valvae in situ, and it is essential to compare these structures from the same lateral viewing angle. Therefore, it is difficult to determine from the numerous published illustrations of "*P. alpheus*" genitalia the actual identity of the species figured. *Pholisora graciellae* has been figured as *P. alpheus* by Comstock (1927) (late summer brood) and his (1929) reference to the early stages of *P. alpheus* refers to *P. graciellae*.

This species is very closely associated with the larval food plant, *Atriplex lentiformis* (although Comstock gives *A. expansa* as the food plant), a very large shrub that forms dense thickets as a sub-riparian associate of the drainage sys-

tems of the lower Colorado River in Arizona, Nevada, California, and adjacent Mexico. It is here that *P. graciellae* occurs, and it is in such situations that this species demonstrates a distinctive behavioral characteristic. The flight of *P. graciellae* is very weak, a fluttering bouncy flight that is quite slow even when away from the larval food plant. Adults tend to remain well within the shrubbery, where their flight is "moth-like", especially slow and weak, and their progress from bush to bush seems to preferentially be restricted to a route through twiggy. They will select a course through a low and dense slash pile to traverse a small interspace between shrubs apparently in preference to a short passage in the open.

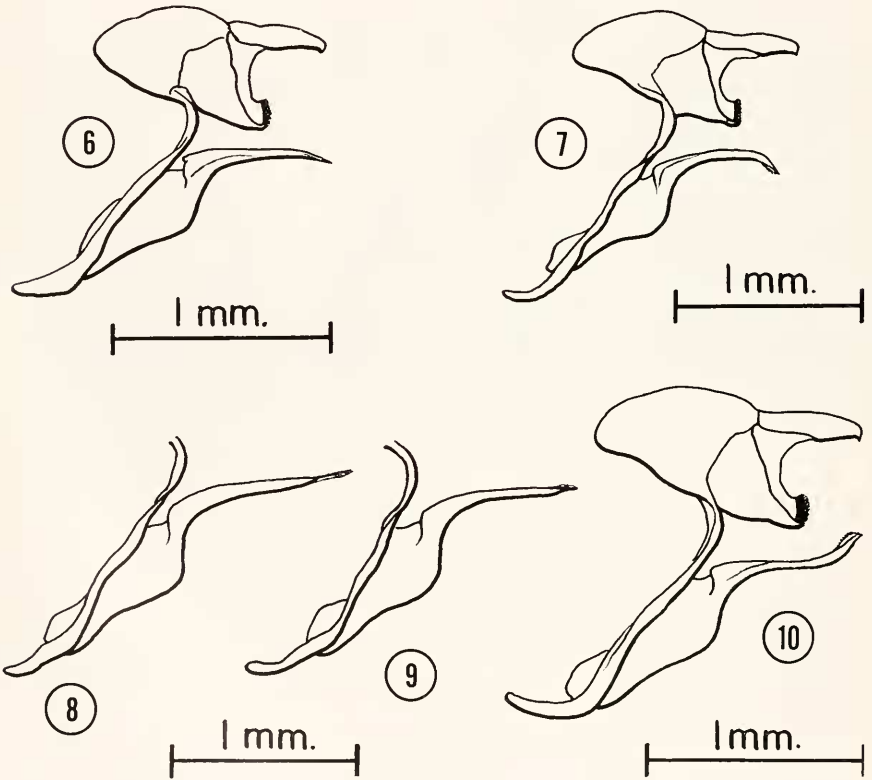
Pholisora alpheus is generally a larger insect than is *P. graciellae* and there is less difference in wing markings between the sexes. The upper surface of the forewing in *P. alpheus* usually has conspicuous white subapical spots, and from these to the vannal margin is a series of elongate wedge-shaped dashes which, in females, may enclose several small white spots. The fringes may be nearly blackish or distinctly checkered black and white. On the lower surface of the hindwing there is generally a thin white bar at the end of the cell, and a submarginal series of small white spots which are always at least as prominent as any suggested pale band between the cell end and the dark vannal fold. The palpi are relatively shorter than are those of *P. graciellae*. *Pholisora alpheus* is widely distributed in the arid west and demonstrates a considerable geographic differentiation through its range. At least two subspecies can be superficially recognized.

The nominate subspecies, *P. a. alpheus* (figs. 1, 2, 3, 7) is a dark insect with little white overscaling on either the upper surface of the forewing or on the hindwing below. The tip of the caudal process of the valvae of males tends to be directed ventrally (in addition to the lateral curve) (see fig. 7) and the minute subterminal wing is almost ventral in position so the flattened tip of the process is somewhat obliquely vertical rather than horizontally oriented. *Pholisora alpheus alpheus* is evidently at least two brooded and individuals of the second brood are somewhat darker than earlier adults. The wing pattern is not obscured, however, in second brood adults. This subspecies ranges from Mexico into Texas, New Mexico, southern Arizona and probably eastern and southern Colorado. According to Roever (personal communication) this subspecies is associated with *Atriplex canescens* in Arizona.

In extreme southern Texas is a population of *P. alpheus* the adults of which are rather small and have wing markings curiously suggestive of *P. graciellae*. The palpi are shorter than are those of *P. graciellae* and though the wing features, particularly of females, resemble that species, they are in detail more characteristic of *P. alpheus*. The male genitalia are rather like those of northern and eastern populations of the following subspecies in that the caudal process of

the valva is horizontally flattened at the tip where it is directed slightly dorsad. The posterior tip of the penis is evidently variable, some examples having a long terminal bevel as in *P. graciellae*, and others having a more abrupt bevel as in most *P. alpheus*. This population is not typical of either *P. alpheus alpheus* or the following subspecies.

Pholisora alpheus oricus Edwards (1879: 51) (NEW STATUS) (figs. 1, 2, 4, 8, 9, and 10) is a striking insect which appears quite different when fresh from any of the populations previously mentioned. Adults are usually large and have on the upper surface of the forewing a heavy vestiture of white overscaling,



Figures 6-10. Male genitalia of *Pholisora*, left lateral aspect of uncus and gnathos, vinculum, and left valva. Fig. 6, *P. graciellae* (Type locality); Fig. 7, *P. alpheus alpheus* (Big Bend, Texas); Fig. 8, *P. alpheus oricus* (n.w. Utah) (vinculum and valva only); Fig. 9, *P. alpheus oricus* (w. Nevada) (vinculum and valva only); Fig. 10, *P. alpheus oricus* (s. California).

particularly distal to the series of wedge-shaped spots where these are in effect outlined in white. The subapical spots are usually large and conspicuously white. The fringes of both wings are boldly black and white checkered. The lower surface of the hindwing appears grizzled owing to heavy white overscaling and the submarginal series of white spots is usually well developed. The male genitalia of the populations inhabiting the Mojave Desert of California are distinctive in that the caudal process of the valve is terminally directed dorsad (see fig. 10), and the minute subterminal wing is almost dorsally placed causing the plane of the flattened tip to be almost vertical. This condition changes, however, in the Great Basin, where the end of the caudal process, one might say, has "rotated" laterally so that the tip is only slightly, if at all, directed dorsad (see figs. 8 and 9), and the wing being lateral imparts a horizontal orientation to the flattened tip. It is in this feature that the genitalia most closely resemble those of *P. graciellae* but even so the tip is usually directed very slightly dorsad rather than slightly ventrad as in *P. graciellae*. Superficially the majority of these Great Basin adults entirely resemble those of the Mojave Desert. In central Arizona, northwestern New Mexico and central Colorado these populations should meet *P. alpheus alpheus* and both the wing characteristics and the features of the end of the valvae can be expected to change toward the condition typical of the nominate subspecies. This subspecies is evidently single brooded, adults being taken only from April to June. This subspecies ranges from the Mojave Desert of California, northward and eastward through Nevada, eastern Oregon, Utah, western Colorado, northern Arizona and extreme northwestern New Mexico. The food plant of this subspecies is *Atriplex canescens* and adults are not found far from this shrub. The flight behavior of this insect is direct, fairly rapid, and in general quite skipper-like when traveling. In the immediate vicinity of *A. canescens* the flight becomes somewhat erratic and hesitant, but adults show no desire to penetrate the shrubbery for long periods or to shun open space.

Acknowledgments

I am grateful to the following individuals for the loan of material in their care or personal collections: P. H. Arnaud (California Academy of Sciences, San Francisco); D. L. Bauer; F. M. Brown; J. M. Burns; P. J. Herlan; C. L. Hogue (Los Angeles County Museum); K. C. Hughes; R. O. Kendall; R. L. Langston; L. M. Martin (Los Angeles County Museum); J. A. Powell (California Insect Survey, University of California, Berkeley); K. Roever; J. A. Scott; O. E. Sette. For considerable help in the field with several populations of this complex I wish to thank the following people: R. L. Langston, D. D. Linsdale, M. R. Lundgren, C. A. Tauber, and M. J. Tauber. The photographs were taken by Stennett Heaton of Oakland, California, and his assistance is gratefully acknowledged. Finally, for rewarding discussions and most fruitful suggestions I especially appreciate the counsel of John M. Burns, Jerry A. Powell, Kilian Roever, and O. Elton Sette.

Literature Cited

- Comstock, John Adams. 1927. Butterflies of California. J. A. Comstock, Los Angeles.
- _____. 1929. Studies in Pacific Coast Lepidoptera. Bull. Southern California Acad. Sci. 28(2): 22-31.
- Dyar, Harrison G. 1905. A review of the Hesperiidæ of the United States. J. New York Ent. Soc. 13(3): 111-141.
- Edwards, W. H. 1879. Descriptions of new species of butterflies collected by Mr. H. K. Morrison, in Nevada, 1878; also, some remarks on some errors of synonymy and arrangement. Canadian Ent. 11(3): 49-56.

2.0042 A new *Pholisora* with notes on *P. alpheus* (Edw.) (Lepidoptera: Hesperiidæ). Abstract.—The species *P. alpheus* (Edw.), *P. libya* (Scud.), and *P. graciælae*, NEW SPECIES, comprise the subgenus *Hesperopsis* Dyar of the genus *Pholisora*. The new species, *P. graciælae*, restricted to the lower Colorado River drainage, has as its principal distinguishing features very long palpi; forewings above usually with a post-discal sigmoid series of poorly defined, short blackish spots, which are scarcely elongate wedge-shaped, running from the soiled white subapical spots to the vannal margin. The hind wings above usually have a pale brown or buff curved band of spots extending from the cell end to the vannal fold, and a less conspicuous submarginal series of poorly defined separated buff spots. The lower surface of the hindwings has a conspicuous curved series of white spots separated by dark veins extending from the end of the cell to the vannal fold, which is contrastingly gray overscaled. The submarginal white spots are usually well developed only on the vannal one-half of the wing, and are never more prominent than the discal series of curved white spots. The length of the forewing of males ranges from 9 mm to 11.5 mm; that of the females from 10 mm to 12 mm. Type locality: Bennett Wash, vicinity Parker Dam, San Bernardino Co., California. Its closest relative is *P. alpheus*. The peculiarly retiring flight behavior is characteristic of the new species, contrasting with the behavior in some populations of *P. alpheus*. The larval food plants of *P. graciælae* and *P. alpheus* are two different species of *Atriplex*. *Pholisora alpheus* is polytypic and the name *P. oricus* Edwards is resurrected from the synonymy to apply to the Great Basin and Mojavian populations of *P. alpheus*. There is some further geographic differentiation between populations of *P. alpheus oricus* with respect to male genitalia.—C. Don MacNeill, Division of Natural Sciences, Oakland Museum, Oakland, California 94607.

Descriptors: Lepidoptera; Hesperiidæ; *Pholisora*; *Hesperopsis*; *Pholisora graciælae*; *Pholisora alpheus alpheus*; *Pholisora alpheus oricus*.